

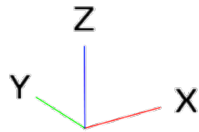
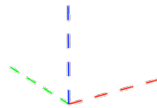
Attachment, Hinge/Slider, Symmetry, and Sub-Surfaces

Rob McDonald

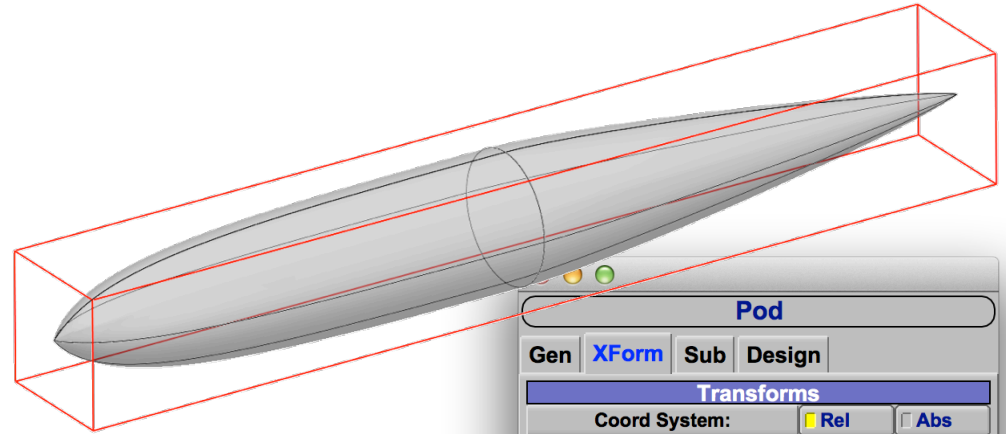
Attach Point

Every component is attached to (or placed in) the model by locating its attach point and positioning the component relative to that point

Attach Point,
only shown
when selected.
(new in v3.9.0)



Axis Orientation
RGB - XYZ



Pod

Gen XForm Sub Design

Transforms

Coord System: ☒ Rel ☐ Abs

XLoc	<input type="text"/>	<input type="text"/>	2.000	2.000
YLoc	<input type="text"/>	<input type="text"/>	0.000	0.000
ZLoc	<input type="text"/>	<input type="text"/>	2.000	2.000
XRot	<input type="text"/>	<input type="text"/>	0.000	0.000
YRot	<input type="text"/>	<input type="text"/>	0.000	0.000
ZRot	<input type="text"/>	<input type="text"/>	0.000	0.000

Rot Origin(X) 0.000

Symmetry

About: 1 PodGeom ☒ Origin ☐ Object

Planar: ☐ XY ☐ XZ ☐ YZ

Axial: ☒ None ☐ X ☐ Y ☐ Z

N 2

Scale Factor

Scale 1.0000

Attach To Parent

Translate: ☒ None ☐ Comp ☐ UW

Rotate: ☒ None ☐ Comp ☐ UW

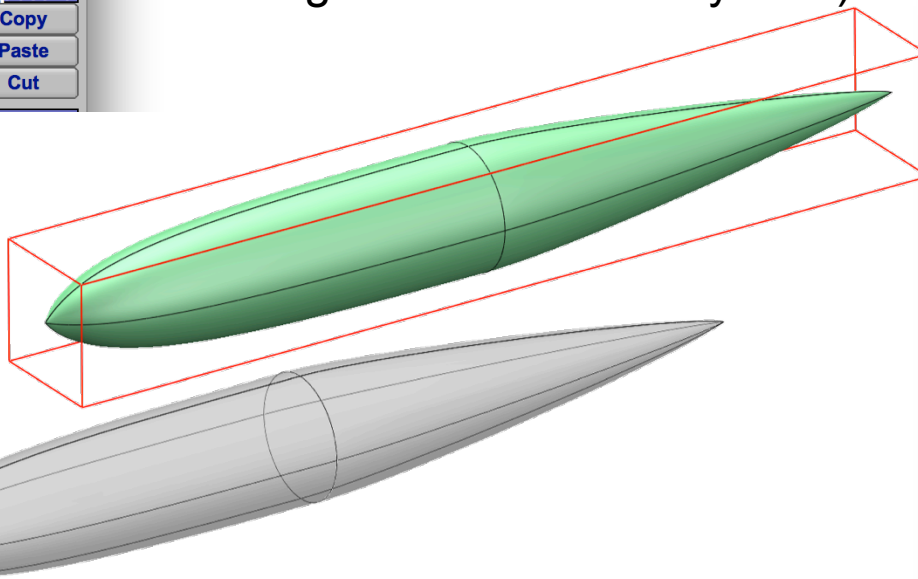
U	<input type="text"/>	<input type="text"/>	0.0000
W	<input type="text"/>	<input type="text"/>	0.0000

Attach to Parent (Comp)

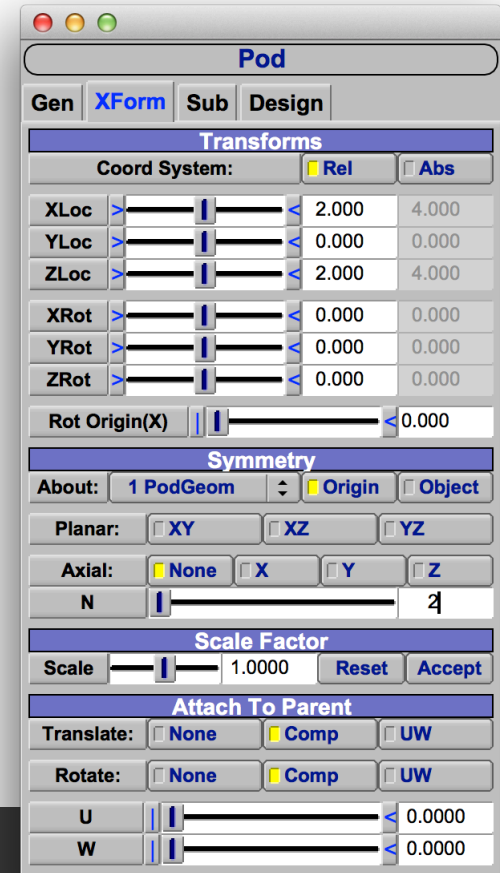
Attachment translates/rotates
the attach coordinate system

(None means attach to
global coordinate system)

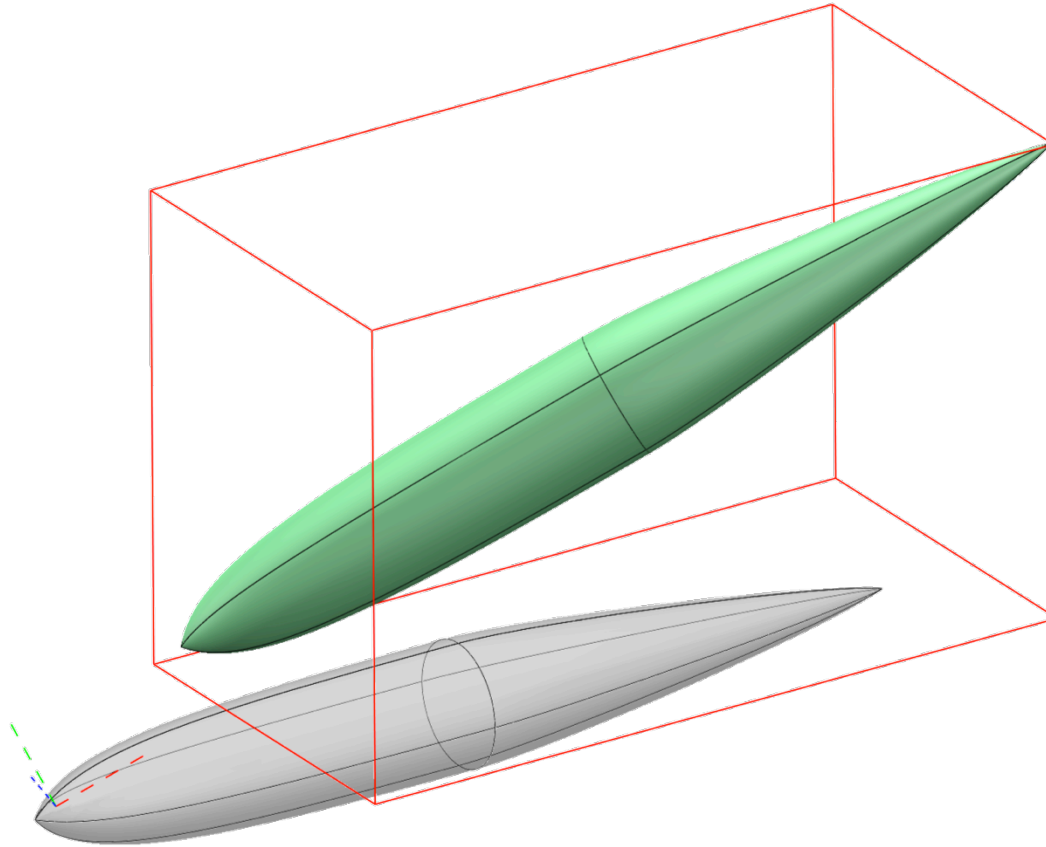
Attachment
indicated by
'^'
in browser



'Comp' attaches
to parent's origin

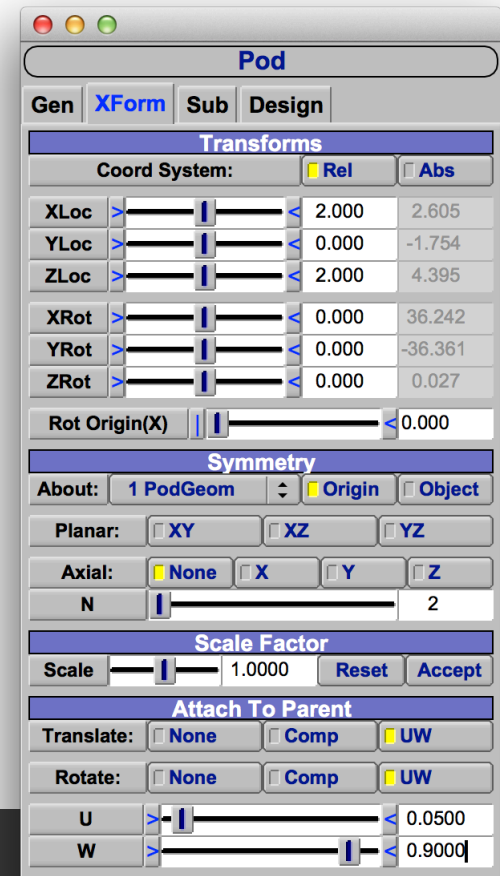


Attach to Parent (UW)



U,W coordinates
run [0,1] along surface

'UW' attaches
to parent's surface



Rel vs. Abs

Attached components always move when their parent moves.

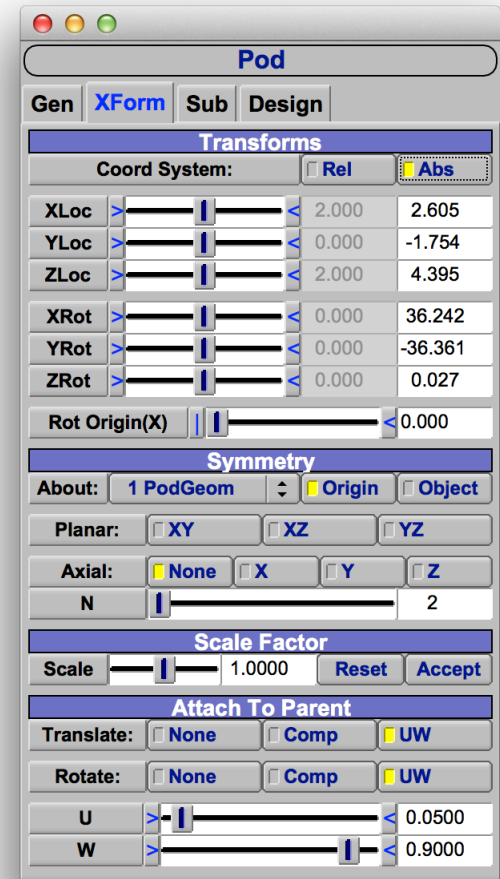
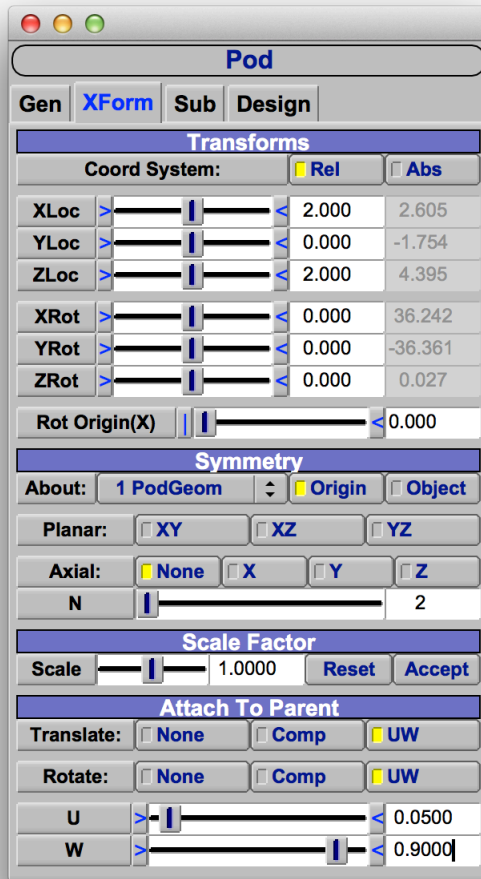
‘Rel’ sets the position/rotation relative to the attach point.

‘Abs’ sets the position/rotation in global coordinates.

When ‘Rel’ is selected, changing attachment moves component.

When ‘Abs’ is selected, component stationary as attachment changes (sometimes confusing).

Changing between ‘Abs’ and ‘Rel’ can be very powerful.

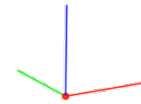


Blank

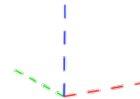
'Blank' components are a way to insert a new coordinate system.

Useful for positioning, mass properties, and grouping.

Blank shown as feature line or when selected



Attach Point only shown when selected.



Hinge (and/or Slider) (new v3.9.0)

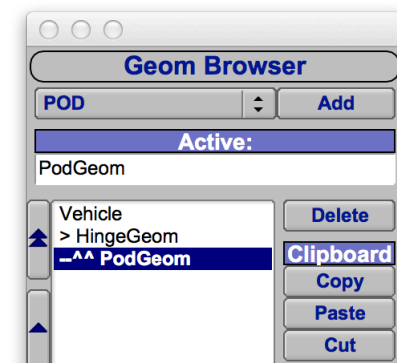
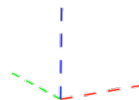
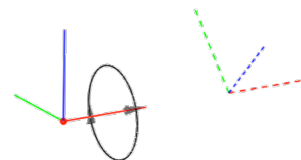
'Hinge' components are a way to add simple motion to a model.

Children of 'Hinge' components are forced attached.

Hinge Fixed Side
shown as
feature line or
when selected

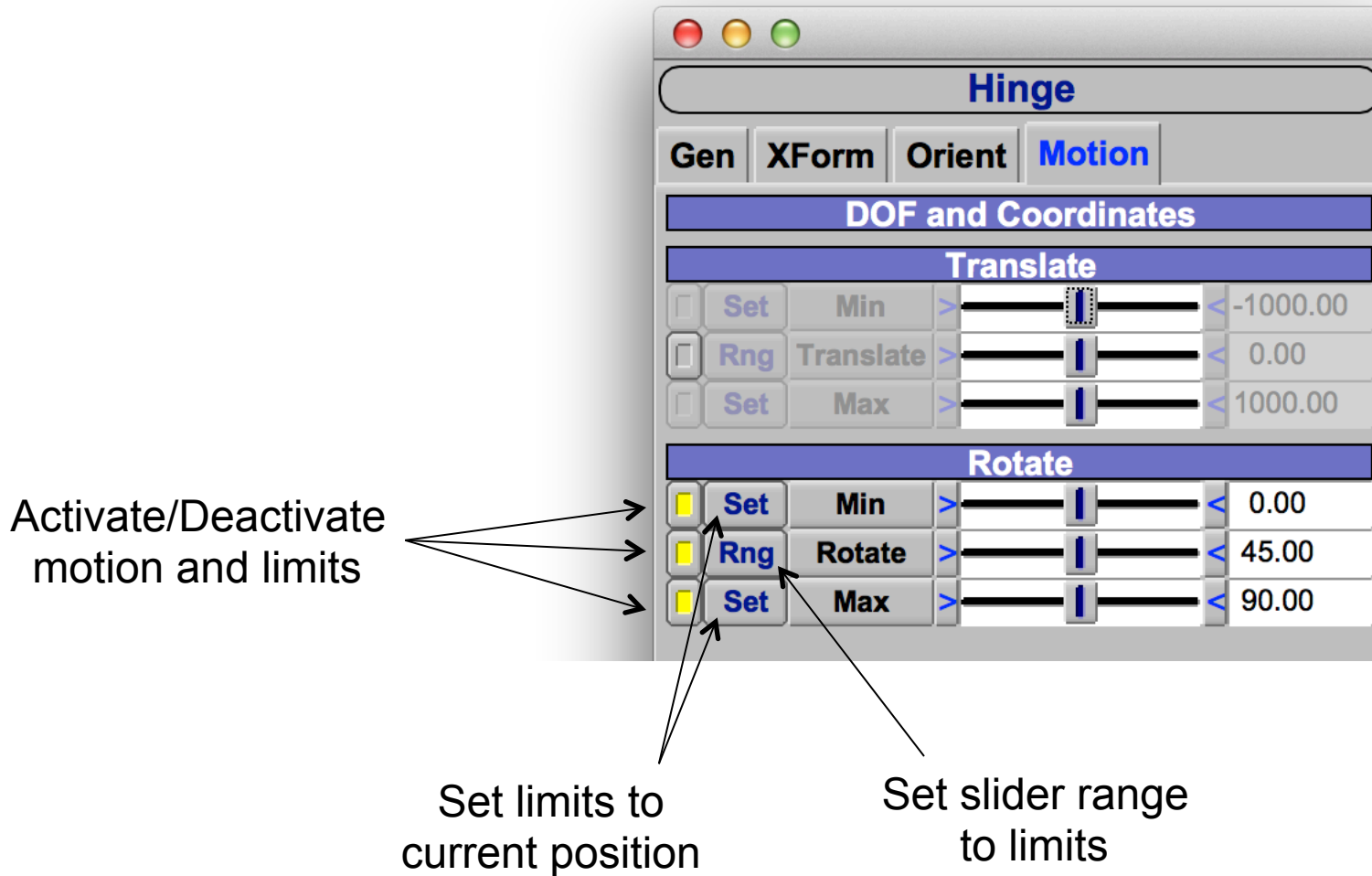
Hinge Motion Side
shown as
feature line or
when selected

Attach Point
only shown
when selected.



Forced attachment
indicated by
'^^'
in browser

Hinge Motion Control



Hinge Orientation

Orient using XForm

Orient using a vector
specified in this GUI

Six ways to
specify vector

3D Vector
To 3D Point
To Point on Surface
Along Surface U-Direction
Along Surface W-Direction
Normal to Surface

VECTOR3D
POINT3D
SURFPT
UDIR
WDIR
NDIR

Reference vector
sets orientation

Hinge

Gen XForm **Orient** Motion

Orient Base

☐ Rotations (Use XForm Tab)

☒ **Vectors**

Vectors

Axis ☒ X ☐ Y ☐ Z

Reference ☐ X ☒ Y ☐ Z

Axis

Type **VECTOR3D**

Direction Vector: ☒ Rel ☐ Abs

	X	Y	Z
X	1.000	0.000	0.000
Y	0.000	1.000	0.000
Z	0.000	0.000	1.000

Offset: ☐ Rel ☐ Abs

	X	Y	Z
X	0.000	0.000	0.000
Y	0.000	0.000	0.000
Z	0.000	0.000	0.000

U ☐ 0.0000

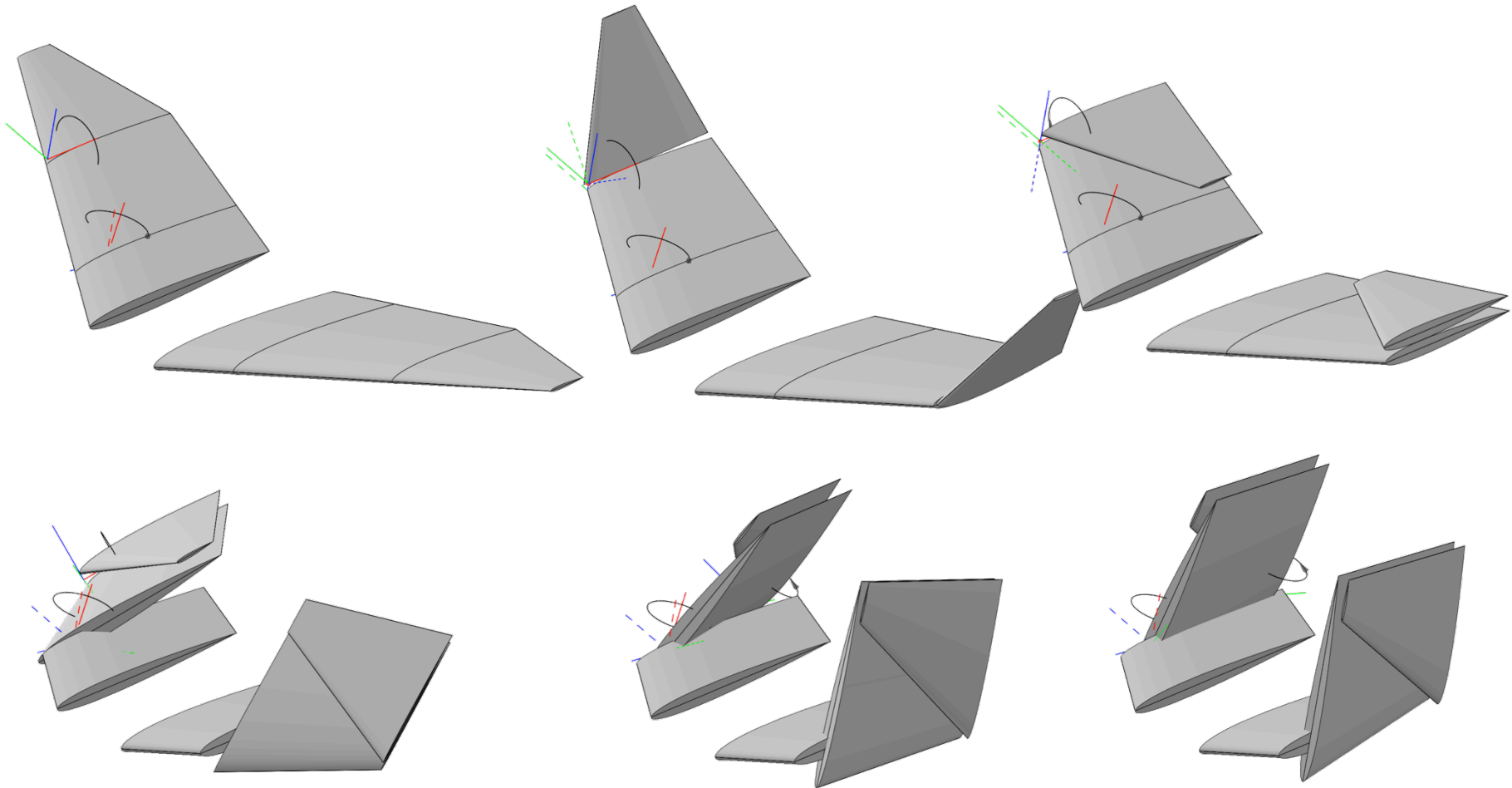
W ☐ 0.0000

Reference Vector

Reference Vec ☐ Rel ☒ Abs

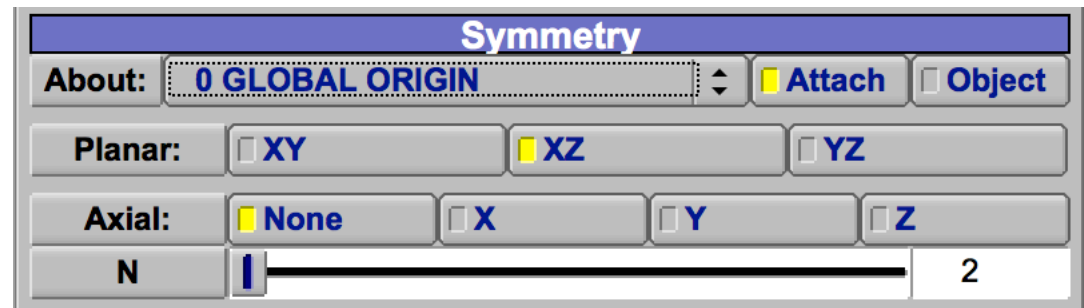
☐ X ☒ Y ☐ Z

Example



Symmetry

Components can be symmetric
about any plane (XY, XZ, YZ)
or axis (X, Y, Z)
of any ancestor
attach point or object.



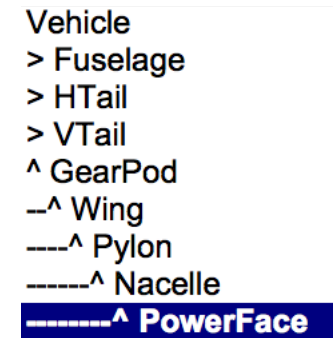
The Symmetry dialog box has a title bar 'Symmetry'. It contains the following controls:

- About:** A dropdown menu showing '0 GLOBAL ORIGIN' with a small up/down arrow to its right.
- Attach:** A button with a yellow square icon.
- Object:** A button with a grey square icon.
- Planar:** Three buttons: 'XY' (grey), 'XZ' (yellow), and 'YZ' (grey).
- Axial:** Four buttons: 'None' (yellow), 'X' (grey), 'Y' (grey), and 'Z' (grey).
- N:** A slider control with a vertical bar on the left and a numerical value '2' on the right.

Global origin is 0

Ancestors
numbered by
generation

- 
- 0 GLOBAL ORIGIN
 - 1 PowerFace
 - 2 Nacelle
 - 3 Pylon
 - 4 Wing
 - 5 GearPod



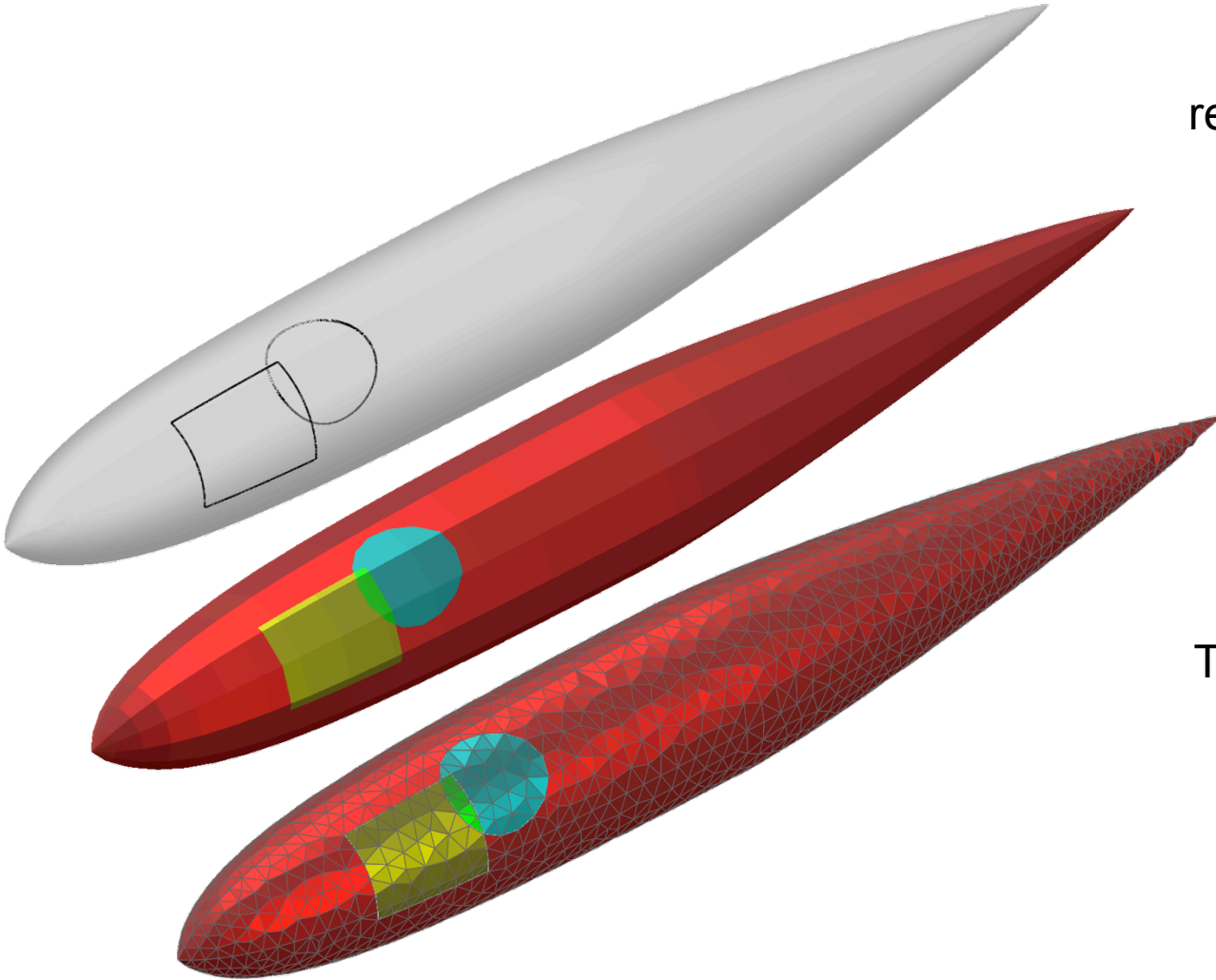
```
Vehicle
> Fuselage
> HTail
> VTail
^ GearPod
--^ Wing
----^ Pylon
-----^ Nacelle
-----^ PowerFace
```

SubSurfaces

Subsurfaces are rectangles, ellipses, or lines defined in (U, W) coords on a surface.

They can represent are honored by CompGeom, CFDMesh, and DegenGeom.

They can be used to model inlet/outlet BC's, control surfaces, material properties, etc.



Questions?

Practice